Santee Cooper

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Mr. Joe Eller
Bureau of Air Quality
South Carolina Department of
Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

Re: The Pee Dee Generating Station Construction Permit Application
Selection of Particulate Matter Control Technology

Dear Mr. Eller,

Santee Cooper is submitting to SCDHEC the enclosed technical documents on the effectiveness of available technologies for controlling particulate matter (PM) emissions at coal-fired power plants. Santee Cooper has selected the electrostatic precipitator for the particulate control technology for this project. We request that SCDHEC consider this additional information in the evaluating the effectiveness of available PM control technologies in completing the "best available control technology" (BACT) review in the pending Pee Dee Generating Station Construction Permit Application. In addition to these technical documents, we are providing below a brief analysis of why electrostatic precipitators (ESPs), instead of fabric filter systems (FFs or FF systems), can be most effective at capturing PM emissions from power plants burning Eastern bituminous coal, as proposed in the Pee Dee permit application.

Overview

Coal-fired power plants emit unacceptable levels of particulate matter in the absence of hardware specifically designed to capture such particulate matter. The dominant capture technologies are ESPs and FF systems. FF systems are deployed on about 27 GW of US coal-fired power plants. ESPs are used by over 280 GW, or about ten times the capacity controlled by FFs.[1] Both types of particulate matter control can reach extremely high levels of capture efficiency, and each appears to have its own strengths and weaknesses.

[1] Data is based on NETL Coal Plant Database, USDOE/NETL, November 4, 2006. See the following website: www.netl.doe.gov/energy-analyses/pubs/NETLCoalPowerPlantDatabase-PublicRelease100606.xls.

Specific Issues

Distribution by coal type. Figure 1 presents data for all pulverized coal power plants in the U.S. using FFs or ESPs, as of the end of 2003 (the year of the most recent NETL data base on this information). This data confirms that 9% of U.S. pulverized coal power plant capacity was equipped with FFs. Only 1% of U.S. pulverized coal power plant capacity burning Eastern bituminous coals was equipped with a FF.

Relevance of sulfur content. No pulverized coal unit represented in the NETL power plant database used a FF on coal higher than 1.8%S. FFs on units burning medium or high sulfur coal have proven problematic in the past. For example, a technical paper by the Southern Research Institute, Pennsylvania Power & Light, and the Electric Power Research Institute documented poor performance of a FF on a PP&L unit burning 1.8-2.0% S coal.[2] PP&L installed a reverse jet FF at Brunner Island Station in York Haven, PA in October 1980. Excessive pressure drops and unusually frequent bag failures soon occurred. Bags which normally would be expected to reach a "loaded" weight of 50 pounds reached over 150 pounds. In addition to failed bags, operators noted visible metal corrosion and moist, sticky surfaces inside bag compartments. Condensation of acid vapors, formed when SO3 reacted with water vapor to create sulfuric acid mist, was believed to be responsible for the problems at the unit. Moreover, the unit was required by PA rules to be online during startups when lower temperatures were encountered, and that was thought to aggravate the condensation problem, even with startup combustion fueled by oil. Use of acid resistant fiberglass bags and ammonia gas conditioning failed to resolve the FF operability problems at this unit.

[2] Demonstration of Strategies for Improved Baghouse Performance, Merritt, et. al., (SRI, PP&L, EPRI).

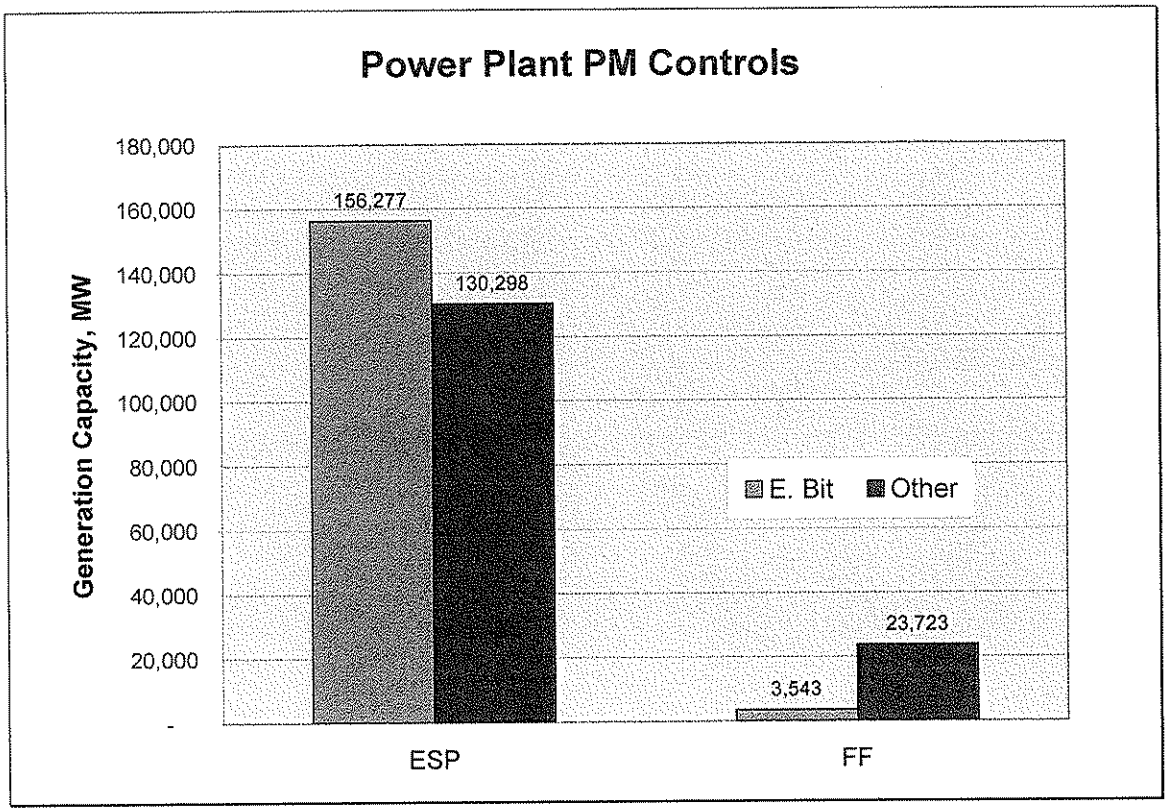

Figure 1. Particulate matter controls by type of coal (Eastern bituminous versus all other coals)

The impact of SCR's. Coal-fired units equipped with selective catalytic reduction (SCR) systems for NOx reduction have been observed to have higher levels of SO3 than systems without SCR. The SCR causes oxidation of a portion of the SO2 created during combustion to SO3. The Department of Energy has estimated that typical SO3 concentrations of 10ppm can increase to 27ppm with the addition of an SCR.[3] This higher level of SO3 can further aggravate the acid corrosion problem with a FF system on a unit burning a range of Eastern bituminous coals.

[3] Projection of US Coal-fired Power Plants Potentially Impacted by Excess SO3 Emissions, J. Murphy, SAIC, Presented at the 2006 Environmental Controls Conference, USDOE/NETL, May 2006.

Additional information. This issue of using FFs with high sulfur coal was addressed in the permitting of the Prairie State Generating Company's 1500 MW coal-fired power plant, by the Illinois EPA. In Prairie State's response to public comments on the proposed permit, they stated:

> The exhaust from units other than the boilers [e.g, material handling equipment] is only contaminated with dust, which baghouses can readily control. However, for the boilers, baghouses would also have to withstand corrosive attack from sulfuric acid mist (H2SO4) contained in the exhaust. The sulfuric acid mist is formed when SO3 combines with the water vapor (H2O) that is also present in the flue gas. If this mist then condenses out of the flue gases and becomes liquid, the droplets are highly corrosive and cause accelerated deterioration of the filter bags and internal components of the baghouse, destroying the integrity of the filter system. Because collected ash or cake on the bags in a baghouse must be removed on a regular basis, by sending clean air "backwards" through the bags, opposite to the direction of normal gas flow, some cooling that could cause condensation cannot be avoided in a baghouse. For high sulfur coal, even if washed, the levels of SO3 are such that cooling is sufficient to cause condensation and lead to corrosion. For low-sulfur coal, the levels of SO3 are lower and the dew point is lower so the cooling generally is not sufficient to cause condensation and the gradual damage to the system is not significant. In addition, the various measures that can be used inside the boiler to absorb SO3 and protect against corrosion are more effective. Acid corrosion is not as critical for ESPs. The ESPs on coal-fired boilers can be operated at constant temperatures so are at less risk for condensation than baghouses. ESPs are also more robust systems, as they do not rely upon maintaining the integrity of a barrier separating dirty flue gas from clean air. Instead, ESPs use electrostatic attraction to pull particles of ash out of the flue gas, so that the flue gas becomes progressively cleaner as it passes through the ESP. Accordingly, the selection of an ESP for control of particulate matter from the proposed boilers is appropriate, as ESPs will be both reliable and highly efficient."[4]

Conclusions

FFs and ESPs both can be highly effective at capturing particulate matter from coal-fired power plants under the proper design conditions. However, for a broad range of Eastern

[4] Responsiveness Summary for Public Questions and Comments on the Construction Permit Application from Prairie State Generating Company, Illinois EPA, Bureau of Air, April 2005.

bituminous coals, ESP's have the advantage of being less influenced by corrosive gases associated with such coals. The advantage is even greater for such Eastern bituminous coal units with SCRs. This tends to make them the more effective choice for addressing particulate matter from these units.

We hope that the foregoing information is helpful in addressing the effectiveness of ESPs in controlling PM emissions from power plants burning Eastern bituminous coal, as compared to FF systems. If you should have questions please do not hesitate to contact Kevin Clark at (843) 761-8000 x5193 or kjclark@santeecooper.com.

Sincerely,

Julie J. Motto, PE for

Jay Hudson, P.E.
Manager
Environmental Management

JAH:JJM:KJC:dks

Enclosures (2)

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